ENGINEERING EDUCATION

Bulletin of the

Society for the Promotion of Engineering Education

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FORE-WORD BY THE PRESIDENT.

P. F. WALKER,

President.

At the time this issue of the magazine reaches our membership, all those who are identified directly with the schools will be immersed in the tasks of the new year. From such information as has come to the President there will be throughout the length and breadth of the country the usual increase in the number of freshmen applying for admission and actually entering upon their program of studies. The continued growth of the technical institutions brings to us certain responsibilities and at the same time very evident opportunities.

One question which is bound to receive a great deal of attention during the coming year is that of the student organization in its association with the national engineering societies. Discussion on this point has been started among professional societies, as well as at some of our institutions. Very definite opinions are being expressed, some of these being to the effect that it is a serious mistake to direct the attention of students to the divisions in engineering at the time when they are in the formative process of development.

It is not my purpose to present the arguments for or against the student branch of a national society. It is rather to call attention to an important element in our work as educators. We have in our power in large degree the determining of the trend of thought of the men who are to direct the engineering affairs of the future. As never before in the history of engineering, engineers are giving their attention to the public service phases of their work. As never before they are realizing that they are citizens of a great republic, with the rights and responsibilities of citizenship, and with a capacity for rendering service which originates in the very nature of their

training and experience. Attention is constantly being directed to the functions of the engineer as a leader and director in enterprise and in public works.

During the school period the mind of the growing engineer may be directed most effectively towards these higher and broader purposes. It may best be done through some form of organized activity. The debate of the student branch question should be considered as a questioning as to what method of student organization may be most effective in the accomplishing of the primary purpose. This has appealed so strongly to the President that he has suggested to the Vice President who is to be the head of the Institutional Committee, Dean O. J. Ferguson of the University of Nebraska, that a consideration of the question be taken as the work of that Committee for the year. No more important matter within the realm of detailed school processes exists. It is the hope that every institutional delegate, and each administrative officer in those schools which may not hold institutional membership, will see to it that a representative is duly designated to take up this work in an active manner. As in other questions a thorough discussion will bring forth the best solution.

THE ENGLISH DEPARTMENT.

The English Committee submits the following progress report of the two sessions of the conference of teachers of English and those interested in the problems of English teaching, which was held in connection with the annual meeting of the S. P. E. E. at Cornell.

The intense and widespread interest in the teaching of English to engineering students was shown by the excellent attendance at each session. Although the time in each instance coincided with that of meetings of other special groups, the sessions were attended not only by English teachers but also by teachers of technical subjects. At the first session, there was a total attendance of thirty-six,—14 English teachers and 22 technical instructors, administrative officers and men in industry; at the second, a total attendance of 43,—16 English instructors and 27 others. The first session was an experience meeting, for those present told what was being done in English in their institutions. At the second, the topic was, "A Closer Correlation of Instruction in English with that in Professional and Technical Subjects."

The definite conclusions from these two sessions, the details of which will be embodied in a later and extended report, apparently are these:

1. There seems to be an increasing tendency to check during the first year the students' qualifications for the college English courses; to demote the poorly prepared and give them special training; and to promote to advanced work those of superior ability. Representatives from several colleges which have either already inaugurated such systems or who are about to do reported on their aims and proposed methods.

2. There seems to be a feeling that there is a need for the English teacher who is not only well grounded in his particular subject but also industrially intelligent, sympathetic, and enthusiastic,—the type of man who has prestige among his

colleagues and who has the qualities that will make it possible for the administrative officer to insist upon the rank and salary that will adequately recognize the importance of English to the other technical fundamentals and give the English teacher respect, encouragement and a professional future.

3. There seems to be a definite desire for detailed information as to what interrelationship between the instruction of English and that in professional subjects already exists, and a need for suggestions of easily executed means whereby every teacher of technical subjects can give attention to and stress in his work with the student and necessity for effective presentation of ideas.

The personality of the teachers, the individual problems of administration, the varying types of students, and the sectional differences make for a divergence in the means by which these conclusions may become workable methods.

The recommendation of Committee No. 12 is:

That in view of these differences in attitude toward the teaching of English, a study of the characteristics of the engineering student, and of the sort of men needed to do the teaching of this subject, a consideration of the content of courses, and the close correlation of the instruction in English with professional and technical subjects, are sufficiently significant, as affecting our educational problems to warrant systematic investigation by the English Committee in coöperation with the new Board of Investigation and Coördination.

The English Committee takes this occasion also to express appreciation of the interest in English which has been manifest on every hand, particularly by teachers of technical subjects. The Committee earnestly solicits continued thought and constructive suggestions from English teachers, from men in engineering practice from industrial leaders and engineering educators as to the best means by which your Committee may work out a policy for English in engineering schools. Such a policy should aim to develop courses and teachers for these courses that will aid in conserving the individuality of the future engineer and in developing his potential qualities

for leadership—qualities which an intensive and unrelieved technical course often has a tendency to leave undeveloped. Suggestions, either critical or constructive, should be addressed to the chairman of the committee, 927 Forest Ave., Ann Arbor, Michigan.

Signed,
J. RALEIGH NELSON, *Chairman,*
S. A. HARBARGER,
F. L. SEAVEY,
W. O. BIRK.

THE ENGINEER AS A LEADER IN TRANSPORTATION.

BY E. H. LEE,

Vice President and Chief Engineer, Chicago and Western Indiana R. R. Co., and the Belt Railway of Chicago.

Man's first means of securing relief from the burden of carrying himself and his belongings, were waterborne craft of various kinds, draft animals and beasts of burden. For thousands of years these continued the only means of transportation.

The invention of the steam locomotive about 100 years ago not only revolutionized transportation, but it changed the face of civilization. Just recently the application of electricity as motive power, and the use of the internal combustion engine in the automobile and motor truck have had a far-reaching effect upon certain phases of transportation. But the steam locomotive was and still is the backbone of land transportation for modern civilization. The railroad created modern industry in this and other civilized countries, and it still continues to be the foundation upon which the prosperity and in fact the existence of the farm, the mine, the factory and all other forms of organized industry rest.

Accordingly I wish very briefly to tell the story of the railroads of our country, together with the influence that the engineer has had as a leader in their development.

The story naturally divides itself into three parts:

The Construction Period, during which the main lines of the railroads were built to occupy and develop a new and virgin country, when the obstacles to be surmounted were principally those set by Mother Nature.

A Transition Period, during which general industry developed and gradually overtook the capacity of the railroads to serve them, when the tracks, equipment and miscellaneous

facilities of the railroads to meet the demands of industry vastly increased in completeness and refinement, as well as in cost, and when the problems to be met gradually changed to those of the

Third Period, approximately the present time when the requirements of industry have grown beyond the capacity of the railroads as a whole to serve them during peak periods of prosperity, and when while many of the old obstacles set by Mother Nature still remain to be surmounted, the chief difficulties requiring solution are those caused by *Human Nature.* The dominant characteristics of each period have appeared sporadically with varying intensity in each other period.

The Construction Period—Only the other day a celebration was held in New York City to mark the 100th Anniversary of the incorporation of the Company which purchased and put in operation the first steam locomotive that ever ran in this country. It is interesting to note that this corporation, the Delaware & Hudson Company, was organized not as a Railroad Company, but as a Canal Company. Six years later the first locomotive, the "Stourbridge Lion" was put in service in Pennsylvania, not far distant from where we now are; and again it is of interest to note that the railroad was of secondary importance to the canal, and purely an adjunct thereto. In 1829 when the "Stourbridge Lion" made its first trip, the population of our country, consisting of about 13,000,000 people, was chiefly concentrated along the eastern seaboard, and along the shores of navigable lakes and rivers. A scattered population consisting of hunters, trappers and farmers eked out an existance in the hinterland away from waterborne transportation, and these relied upon draft animals and beasts of burden. The prevailing characteristic of the life of the time was its autonomous simplicity. Each family and each community provided for its own needs as to food, clothing and shelter. Luxuries were few, money was scarce. Farmers spent days and even weeks hauling a few bushels of grain or other products to the nearest market, to be sold at one tenth

recent war prices, or to be bartered for a few pounds of salt, sugar, or other necessities.

The construction of the railroads of our country first began in the regions adjacent to the eastern seaboard. Thence main lines along various routes pushed westward over the range of the Allegheny Mountains, first to the Ohio River, thence westward in succession to the Mississippi and Missouri, and in 1869, only forty years after the first locomotive turned its wheels, the last spike was driven in the final railroad link which tied together the Missouri River and the Pacific Coast. During this period the railroads were far from meeting with any opposition from the population of the country either in their construction or operation. The land owner both on the farm and in the small community gave his right-of-way; cities, counties, States and the Federal Government voted aid of various kinds to assist in the construction of the railroads. And why not? Men were actuated then by self-interest as they are now and always will be. They saw in the advent of the railroad the waving of a magic wand, that multiplied their possessions an hundred fold. The leaders of transportation who projected and constructed the railroads during this period saw a vision; the thousands of square miles of fertile land, the best in the world for the production of food stuffs, lumber, minerals, and other raw materials, and capable of sustaining a vast population, awaiting development. They saw this empire to be occupied, and the millions of passengers and billions of tons of freight that would load their trains. They saw themselves becoming the financial leaders of the nation, as the projectors and constructors of the railroad lines to serve this vast area.

The difficulties to be overcome in the construction of the railroads of the period were mainly those set by nature; vast distances to be covered, mountain ranges to be surmounted and tunneled, streams, rivers and canyons to be bridged, swamps to be filled, and waterless deserts to be crossed. And in that day little in the way of modern machinery existed;

the use of high explosives for excavation, of compressed air for driving tunnels and sinking deep foundations, and the use of steel itself for rails and bridges were practically unknown. Epidemics of disease, which medical science had not yet learned effectively to control, frequently decimated the construction camps; and as the work proceeded westward, the raids of hostile Indians added to the obstacles set by nature. The leaders of transportation of that day were Titans, men of brains, of indomitable resolution. The railroad industry was the romance of the period and it drew to itself as if it were a gigantic magnet the best brains and brawn of the time.

The engineer had an important part in the construction of the railroads. He located their routes between points selected by their projectors, planned their structures, and supervised their construction. He was a man of simple tastes, of great perseverance and tireless industry. He was compelled to endure the extremes of heat and cold, and many times the pangs of hunger and thirst. He received little assistance in his work from the aids developed by modern science and invention and he was therefore compelled to rely upon keen powers of observation and a robust common sense. The success with which he carried on his work in many specific cases fills modern engineers with astonishment. But his work in the mountains and forests, on the plains and deserts, was isolated. He was not gregarious, and except as an organizer and director of his own work, he seems to have been lacking in the arts of the politician and promoter, the mental qualities that would have fitted him to lead and control other men. He was therefore seldom among the real leaders of transportation. Too often he was regarded as a necessary evil, essential during construction, but to be dismissed promptly upon completion of the work. There were notable exceptions. Typical among these was General Granville M. Dodge, whose experiences as an engineer and as a transportation leader were characteristic of the period. He discovered the route now used by the Union Pacific up Sherman Hill, the eastern bastion of the Rockies,

and he was compelled to ride for his life upon that occasion, to escape a band of hostile Sioux. He later became prominent in the projection, construction and operation of railroads.

During the latter part of the Construction Period the schools and other institutions of learning began more and more to offer specialized courses in engineering. Their graduates were thereby better enabled to do their part in the transportation industry of the country. Young men of brains, plus this special training, were able to analyze conditions and to make application of the discoveries in pure science and of the inventions of the time, and thus were able more frequently to demonstrate the value of their work as engineers. They rose in official position, the tenure of office of all engineers in the transportation field became more secure, and transportation consequently attracted ambitious young men to an engineering training in increasing numbers.

Transition Period.—With the gradual ending of the Construction Period and the beginning of the Transition Period, marked changes came in the problems confronting the railroads. Population had rapidly followed the construction of main line routes. The stronger companies had built branch lines in the process of occupying new territory. Many smaller railroads were constructed by relatively weak companies. Most of these were eventually forced to the wall for various reasons, generally because of poor financial structure, unwise location, or wasteful management, coupled with severe competition. Such lines were usually acquired by a stronger company and consolidated therewith. Most of our great railroad systems have been built up by this process. For example, the Pennsylvania Railroad, the greatest system in the country in point of traffic handled, is a consolidation of over 600 corporations, and it still maintains its corporate existence and control through the instrumentality of over 70 different corporations.

As the country developed and general industry grew, the growing traffic began to tax the capacity of permanent way and equipment. To meet the increasing requirements the

railroads reduced gradients and bought heavier power to increase train loading. They built interlocking signal plants, separated grades, and installed block signals to speed up train operation. They constructed second, third and fourth main tracks, added to the length and number of side tracks, and made large additions to locomotive and car equipment to increase capacity. Most of the fixed improvements were made on the open country lines, and improvements in the terminals had failed to keep step in any corresponding way, perhaps because the great effort of the Construction period to open up new country for the development of traffic, had become a fixed habit. The largely increased equipment tended to lodge in the terminals, and the vast traffic flowing to them in a flood, caused periodic times of intense congestion centered in the terminals. Transportation officers began to devise expedients to better conditions. Traffic was held back at its source, as flood water is sometimes impounded in storage reservoirs. Trains were made up to run maximum distances without breakup and reclassification. And every device was sought, to speed up the loading and movement of cars in the terminals. But fixed improvements in the terminals lagged behind similar improvements in the open country lines, perhaps because as an added reason they were enormously the more expensive of the two. When plans were made to eliminate the Terminal as a focus of congestion, by building larger yards, rearranging and adding more main tracks, building modern engine houses, repair shops, freight stations and other terminal improvements, it was generally found impossible to raise the money required to finance them.

A great change had appeared in public sentiment which impaired railroad credit and dried up the sources of capital for railroad improvement. This change came about for various reasons. Railroad construction was largely over and the self-interest of the average man led him to expect more from reduced rates than as formerly from either the advent of a new railroad or the profits of its construction.

Railroad leaders had become accustomed to uniform success in their struggle with the difficulties set by nature. They had grown in power, and they were not always careful sufficiently to recognize the needs and the rights of the public. Hard times caused general unrest and discontent. Politicians sought to capitalize this unrest to their own advantage by baiting the railroads. Laws were enacted establishing commissions both state and national, which promptly began a policy of restrictive regulation and rate reduction. The revenues of the railroads were thus impaired, the payment of dividends became the exception rather than the rule, and even fixed charges were frequently not earned. The credit of the railroads waned. Private capital found more profitable investments elsewhere. And therefore while the general industry of the country continued to expand, the improvements in railroad plant and equipment to meet the growing requirements began to come to a standstill, particularly in the terminals.

From the foregoing it must not be assumed that all capital expenditures on the railroads had ceased. As a matter of fact 8 billion dollars have been raised and spent upon the railroads in the last 15 years, although this investment failed to earn current interest in many specific cases. Even larger sums of money were needed to keep pace with the growth of general industry, and the expenditures upon the terminals, where improvements were most urgent, were relatively less than upon the open country lines.

Union labor now began to grow powerful. It began to favor Government ownership, for its own reasons. Public opinion seemed to veer in that direction, and the politicians followed along. Then came the Great War with its profound effects upon all industry. The operation of the railroads was taken over by the Federal Government, and succeeding events are too much a matter of recent history to need relating here.

What of the engineer during this Transition Period? His work on the railroads had become increasingly important. As

the designer and constructor of the vast physical improvements of the period, his value had been demonstrated and his tenure of office had become secure. The civil engineer had become indispensable in planning and constructing fixed improvements, in analyzing the effect of speed, curvature, and gradients, upon train tonnage, and in like activities. Mechanical engineers had made great advances in the design and construction of steam locomotive and car equipment; and electrical engineers had developed the electric locomotive as an improved and more economical power unit than the steam locomotive, under certain favoring and well-understood conditions. Men of engineering training had more and more frequently become, in the true sense, leaders of transportation.

Mr. John Newell, president of the Lake Shore Railroad, was a typical example in the early part of the Transition Period. When unable to secure the approval of the owners of his railroad for the purchase of heavier locomotives, because of their supposed destructive effect upon track, he greatly reduced gradients instead, thus moving heavy trains with light power, and thereby kept abreast of his competitors.

The list of engineers who have come to occupy leading positions in transportation during recent years is too long to enumerate here. The tendency has been more and more to advance engineers to positions of leadership. The same trend may be expected to continue if men with the natural endowment for leadership continue to seek an engineering training.

Third Period, the Service Period.—Favorable public opinion is vital to the success of transportation in this country. Though they doubtless did not know it, the railroad builders of the Construction Period owed their outstanding success to public sentiment favorable to their plans and projects. The change to a public opinion unfavorable to transportion, brought about by various agencies, doubtless caused most of the embarrassments and relative failures that gradually developed in the industry during the Transition Period. The railroads were taken over and placed under Federal Control

as a war measure, but it can hardly be doubted that this step was only taken because of the state of public opinion relative to the railroads. It is needless to recount the faults of omission and commission during the period of Federal operation, caused largely by political control, and an intense and destructive centralization of authority. The one favorable outcome of that experiment has been a substantial revision of public opinion in favor of private ownership.

For the purposes of this story, the Period of Service begins with the return of the railroads to their owners early in 1920. It is so called because service, the securing of the maximum transportation effort, the maximum efficiency of railroad plant and equipment, and the maximum restoration of morale in the working force, all for the benefit of general industry, is and must be the main objective for the transportation leaders of today.

The results already secured in the last three years are little short of amazing, as shown by these facts briefly stated. Present railroad traffic is the heaviest in the history of the country, heavier than at the end of Federal Control in 1920 by over 100,000 loaded cars per day, or 13 per cent. As against this, 200,000 less men are on the payrolls of the railroads than in 1920. It costs $2,000,000 less per day (over six hundred millions less per annum) to handle the present traffic, than it did to handle the lighter traffic in 1920.

Railroad leaders have shown that they are alive to the need of favorable public opinion by their recent unexampled efforts to give good service to industry. They are enforcing an effective plan to push the repair of equipment and they have appropriated within the year over a billion dollars for the purchase of new equipment and for fixed improvements. They are beginning to see that in addition to service, publicity is desirable, in fact is vitally necessary. Leaders in other forms of organized industry know the value of advertising. It is a fundamental requirement of successful business. Public opinion is only the collective opinion of average men, and the

average man is not a leader. He is a follower. He instinctively demands and will have leadership. And if the leaders of transportation and of other forms of industry fail to create a wise and favorable public opinion by advertising, by a systematic spreading of the facts that have a fundamental bearing, the politicians and demagogues stand ready with a propaganda of half information and misinformation to deliberately mislead public opinion for their own sinister purposes.

We have seen how the more difficult problems in the transportation field have changed in character, from those relating to material things as formerly, to those relating to human relationships and human nature as at present. Men are born with the brains and force of character essential to leadership. Education cannot supply these qualities. It can only assist in making them available for more effective use. The engineering profession, along with other so-called learned professions, is composed of a minority who are endowed with the qualities for leadership, and a large majority, the craftsmen in the work, who instinctively seek to be led. The question of how to separate the two kinds of men early in their educational training is an exceedingly difficult problem, but is it incapable of approximate solution? If it can be solved with any degree of accuracy, may I venture the opinion that the engineer who in the future will be the craftsman of the profession is now receiving too long and expensive an education; and that the engineer who is to be among the leaders of transportation in the future is entitled to a better training than he is at present receiving, to enable him to deal wisely with those most difficult problems that he will encounter, growing out of human nature and human relationship. He needs a wider intellectual horizon; an education to stimulate initiative and to develop administrative ability; a more thorough training in the art of speaking and writing the English language. To use the vernacular of manufacturing industry, he is already well trained in existing courses of education in the "producing end," but he needs a better edu-

cation in how to "sell" himself and his ideas to his superiors, and how to "sell" the valuable results accomplished in his industry to the Public. Thus will engineers of suitable natural endowment be properly equipped to contribute their share toward the solution of those great and difficult questions which now loom upon the horizon of all industry.

REPORT OF THE SECRETARY FOR 1922–23.

This, the thirty-first annual meeting of the Society for the Promotion of Engineering Education, marks the close of 30 years of activity and service in the development of engineering education. I believe it also marks the beginning of a new era of activity and service. During the past 30 years, many changes have taken place in the type of instruction, methods of admission, personnel of the teaching staff, and the curriculum. In all these changes, this Society has not only been the leader but also the stabilizer. The Council at the Illinois meeting took steps to maintain and enhance the leadership of the Society in Engineering Education by the appointment of the Development Committee.

Development Committee.

The resolution appointing this Committee states "that the President of the Society appoint a committee of five (5) members, including himself, to study the development of the Society for the Promotion of Engineering Education and to formulate an answer to the question, 'What can the Society do in a comprehensive way to develop, broaden and enrich engineering education?'" President Scott appointed, on July 7, 1922, M. E. Cooley, J. H. Dunlap, D. C. Jackson, F. W. McNair and C. F. Scott as members of the Development Committee. It was provided by the Council that the Secretary should be Ex-Officio Secretary of the Committee.

The first meeting was held in New York City on July 10, 11 and 12, and a second meeting in Pittsburgh on July 19. The report as prepared was afterwards edited and revised and submitted to the Council on August 8, 1922. The complete report, as approved by the Council, was printed in the September number of Engineering Education. In accordance with this report which states "*I. That there be created within the Society a Board of Investigation and Coördination, con-*

sisting of five (5) members, under whose general direction there shall be organized and conducted (a) an active campaign for the promotion of engineering education in light of the needs of the future as those needs may be developed; (b) there shall be coördinated as far as possible the activities of the various agencies interested in promoting engineering education; and (c) there shall be conducted research in engineering education."

"V. That President Charles F. Scott be a member of the Board and have authority to appoint the other members; that the terms of the initial members be 5, 4, 3, 2, and 1 years respectively, the individual assignments being made by lot . . . "; President Scott, on September 29, 1922, appointed the following members of the Board, and the length of service was determined at the organization meeting October 19, 1922, as follows: J. H. Dunlap, 1 year; M. E. Cooley, 2 years; C. F. Scott, 3 years; F. M. McNair, 4 years and D. C. Jackson, 5 years. The Secretary of the Society was made Secretary of the Board by the action of the Development Committee. The terms of office coincide with the fiscal year of the Society; namely, June 30.

At the organization meeting, it was voted to send a letter to the deans or other administrative officers of engineering colleges, asking for reactions on the report of the Development Committee. This letter was sent to 141 engineering schools. The letter and abstracts of replies were published in the November and December numbers of ENGINEERING EDUCATION. The Kansas Nebraska Section, by formal resolution, endorsed the plan, and the University of Michigan and the Case School of Applied Science formally endorsed it.

FUNDS FOR THE WORK.

The matter of securing adequate funds for the work occupied a considerable portion of the time at the second meeting of the Board on October 21. The possibility of securing funds from different foundations was discussed, and it was decided that President Scott and Professor Jackson should

see Dr. Pritchett of the Carnegie Corporation and discuss with him the project as supplementing and continuing the work done by Dr. C. R. Mann.

A second conference was held with Dr. Prichett on December 8. Following this conference, a letter signed by the Board making suggestions as to the investigation to be undertaken, with an estimate of the funds required was sent to the Carnegie Corporation.

Dr. Prichett replied as follows on January 19, 1923:

"At their meeting on January the twelfth, the trustees of the Carnegie Corporation gave careful consideration to the statement placed in my hands by you and your colleagues with regard to a study of engineering curricula.

"The trustees have recently made several grants looking toward similar inquiries, and these grants have generally been made in conjunction with similar grants for the same purpose from such agencies as the General Education Board, the Commonwealth Fund, and the Rockefeller Foundation. We were therefore somewhat disposed to feel that a project of this sort ought to be supported in common by these agencies interested in the development of educational methods.

"The trustees of the Carnegie Corporation therefore suggest that before their next meeting, which will take place in about six weeks, your committee ascertain whether other agencies such as those mentioned would be willing to join with the Carnegie Corporation in support of this enterprise."

The result of conferences with the Commonwealth Fund and the General Education Board was contained in a letter from President Scott to Dr. Pritchett under date of April 12, 1923, Dr. Pritchett having been away for some time. This letter reads as follows:

"Your letter of January 19 suggests that before the next meeting of the Carnegie Corporation our Committee ascertain whether the General Education Board, the Commonwealth Fund and the Rockefeller Foundation would be willing to join with the Carnegie Corporation in support of the project of the Society for the Promotion of Engineering Education.

"The Rockefeller Foundation does not include education in the United States within its normal activities.

"We have had conferences with the representatives of the General Education Board and the Commonwealth Fund. Following the conferences, we have placed in their hands a statement of the situation, copy of which accompanies this letter. In our conferences we have met cordial reception and appreciative interest in our proposition. In both cases, however, there was evident a feeling that as the Carnegie interest had taken such an important initial action in regard to engineering education that it would be quite appropriate for the present project to be under the same auspices. Dr. Butterick and Professor Farrand suggested conferences with you as to the policy to be followed.

"As neither the General Education Board nor the Commonwealth Fund have had recent meetings of their boards, it has not been practicable to get official replies as suggested in your letter.

"I am very hopeful that if you can initiate this project along the line you indicated in your first interview that the other agencies might join later if they do not desire to do so now.

"Personally, I feel that it would be a splendid thing if you, following the service you have already rendered, could initiate this new project and I trust you will find your way clear to do so.

"Professor Jackson and I expect to be in New York on Thursday, April 19, and will be pleased to have an appointment with you on that day to discuss the action which the Carnegie Corporation may have taken at its meeting on Monday."

A final conference with Dr. Pritchett was held early in May. The whole matter was discussed in great detail and suggestions were embodied in a letter under date of May 26 as follows:

"In the numerous conferences which members of this Board have recently had with you, there has taken shape as a result of your thoughts and theirs a program for this significant movement to better Engineering Education.

"We submit the accompanying memorandum which we believe expresses the conclusions reached in these conferences.

"What appeals to us as the supreme opportunity to inaugurate this movement, and to arouse and crystallize in effective manner additional enthusiasm for it in the engineering

colleges will be presented by the forthcoming convention at Ithaca, June 20. During the year, comment in the Bulletin of the Society and correspondence by this Board have aroused vital interest and expectancy regarding what plan of procedure and financial support for the same this Board will announce at Ithaca.

"Each member of the Board believes that a statement of your attitude toward this movement, of your active interest in it, and your counsel in shaping the program, will be a very great aid in bringing the interest and enthusiasm of the colleges to a focus resulting in effective inauguration of the work with the opening of the academic year.

"We therefore solicit an expression of your judgment of the program outlined and of your intention to recommend it for financial support which we may carry before the Ithaca convention."

Attached to this letter was the following memorandum:

"The Society for the Promotion of Engineering Education purposes during the next three years to make a discriminating study of the present state of engineering education.

"In undertaking this work, the Society realizes the need of bringing it within a designated field in order that the investigation may lead to definite results. It is also clearly recognized that other studies on the same subject being made at this time should be related to that which the Society for the Promotion of Engineering Education has in view—particularly the investigation now under way by the National Industrial Conference Board, which approaches the subject from the standpoint of the man in industry who employs engineers and from the standpoint of practicing engineers themselves. The inquiry proposed by the Society is primarily an educational point of view.

"It is therefore proposed that the investigations of this Society be directed to a study of the objects of engineering education and the fitness of the present-day curriculum for preparing the student for his profession. It will study the process by which the curriculum of fifty years ago has come to its present form; it will seek to set forth the nature and the weakness of the curriculum as at present administered; and it will indicate such modifications or developments as would seem to make for a sound, well-balanced, and fruitful course of study for engineering students.

"The following organization and programme is suggested as one fitted to this investigation:

"1. The inquiry shall be carried on under the general direction of a committee appointed by the Society for the Promotion of Engineering Education, with the understanding that this committee shall include at least two men chosen from outside the Society and the engineering profession, whose point of view will be primarily that of the trained teacher.

"2. The active conduct of the study will be under the supervision of a Director appointed by the committee, whose office shall be in New York, and if possible, in the Engineering Building. The publication of the results of the study will be also in the hands of the Director.

"3. The Director shall organize committees in the faculties of as large a number of engineering schools as may be practicable, who shall coöperate with the committee and with the Society for the Promotion of Engineering Education in the prosecution of this study.

"4. Inasmuch as a study of the engineering curriculum of American schools should include a knowledge of, and comparison with, the best schools in Europe, it is considered necessary that the Director of the Committee shall, as soon as his work is organized, visit the engineering schools of European countries as may throw light upon the best methods in engineering education.

"5. It is believed that the cost of this inquiry will amount to $24,000 the first year; $36,000 the second year; and $48,000 the third year, including the cost of publication. It is hoped that these sums may be obtained from such educational foundations as are interested in the prosecution of inquiries as important and as promising as ths."

The following is Dr. Pritchett's reply:

May 29, 1923.

"I beg to acknowledge your letter of May the twenty-sixth submitting a memorandum concerning the proposed study of engineering education.

"As you state in your letter, this memorandum follows closely the decisions reached in the conferences we have held during the past year; and it commends itself to me most thoroughly as a well-planned and promising project, the completion of which will be of great service to engineering education. I should go even further and say that such a study

seems to me essential at this time, and I can think of no better means of carrying it out than through the organization and programme described in your memorandum.

"It goes without saying that your choice of a director will be a matter of vital importance. No supervision by the committee in charge will take the place of an able, energetic and liberal-minded man who will give his whole time to an extensive study of this problem.

"I am also convinced of the great significance of the plan through which the faculties of a number of engineering schools will coöperate, through committees, with the Society for the Promotion of Engineering Education in the prosecution of this study. Such coöperation will mean not only that the faculties of these schools will be in close touch with the study and will take part in the conclusions reached, but it will also help to create among teachers of engineering a hospitable attitude of mind toward the report of the Committee.

"I shall take pleasure in commending this project to the President of the General Education Board and to the Adviser in Educational Research of the Commonwealth Fund, and I shall heartily recommend that the Carnegie Corporation participate in its support.

"I am,

"Very sincerely yours,

(Signed) HENRY S. PRITCHETT."

CHARLES A. COFFIN FOUNDATION.

On November 1, 1922, Dr. W. R. Whitney in charge of the Research Laboratory of the General Electric Company addressed the Presidents of the American Institute of Electrical Engineers, the National Academy of Sciences and the Society for the Promotion of Engineering Education asking comment on a proposal by which representatives of the three organizations would coöperate in the awarding of research fellowships. The Executive Committee agreed to participate. The plans were subsequently set forth in a pamphlet which contained a letter from Gerard Swope, President of the General Electric Company, announcing the establishment by the Company of the Charles A. Coffin Foundation, providing $5,000 annually for fellowships to graduates of American colleges

desiring to continue research work. The members of the Charles A. Coffin Fellowship and Research Committee are:

F. B. JEWETT, President of the American Institute of Electrical Engineers.

JOHN C. MERRIAM, Representing National Academy of Sciences.

CHARLES F. SCOTT, President, Society for the Promotion of Engineering Education.

The original pamphlet indicates that this committee is for advice and coöperation in the awards. As developed later, however, the full authority of making the awards has been assigned to the committee. They received applications and made the awards in May of this year for seven fellowships for the coming year ranging from $500 up to $1,000. The selection was made from a total of forty-two applicants.

The General Electric Company desires that the same representatives shall serve during the coming year in order that the initial experience may be utilized in determining the future policy to be followed in administering the fund.

If past precedent is followed, the choice of the representative of the Society for the Promotion of Engineering Education will be made by the General Electric Company subject to the approval of the President of the Society.

HIGHWAY EDUCATION BOARD.

This Board was appointed by the United States Commissioner of Education, Dr. P. P. Claxton, in May, 1920, at the request of a number of persons attending the conference on Highway Engineering and Highway Transport which was held in Washington May 14–15, 1920. This Society has been represented on this committee since its appointment by your Secretary. The work of the Board has been closely affiliated with that of the Society. The activities of the Board have been devoted to the following:

1. The holding of national and regional conferences on highway engineering and highway transport, of which two

national conferences have been held, the last one being in Washington on October 26, 27, and 28, 1922. To this conference were invited a large number of representatives and teachers of these subjects, who were members of this Society. There were also present a number of representative men in closely allied fields. At this conference President Scott spoke on "Education for Leadership."

2. Two essay contests have been conducted each year, one on safety, the funds for which are provided by the National Automobile Chamber of Commerce, and the second known as the Firestone Good Roads Essay, the prize for which is a four-year college course, all expenses paid by Mr. H. S. Firestone. During the past year, these two essay contests have reached more than a million teachers and pupils in the schools in this country. This means a very good and complete organization of the country into suitable districts. The subjects of the Firestone content this past year was, "How Good Roads are Developing my Community."

Two highway exhibits were prepared under the direction of this Board, one rubber exhibit and one road exhibit prepared by the United States Bureau of Public Roads. This exhibit consists of twelve road and bridge models. The exhibit has traveled more than 30,000 miles and has been exhibited in more than 100 engineering schools. Many letters of appreciation have been received by the Board from numerous institutions in regard to this exhibit. The second exhibit pertaining to vehicles using highways, especially automobiles, is being prepared.

The Board has published a large number of bulletins; notable among these was the "Six Safety Lessons" submitted in the National Safety Lesson Contest by teachers. Seventeen thousand copies of this book are being used as textbooks in the schools. The Preliminary Topical Outline of the Economics of Highway Transport was prepared by Professor L. W. McIntyre of the University of Pittsburgh and some 15,000 were distributed. More than 7,000 copies of the Proceedings of the Second National Conference were distributed. This

booklet has been very useful in various state legislatures, and for incoming governors who wish a preliminary survey of the present status of highway engineering and highway transport. The Board has received numerous commendary letters from governors.

National Industrial Conference Board.

The National Industrial Conference Board has been at work during the past year in making a study of the needs of industries for different types of technically trained men. A meeting of the Joint Committee with this Society was held in New York on May 25, at which several members of the Society were invited to discuss a preliminary report. The general subject with some of the outstanding facts of the investigations will be presented at this meeting by Mr. O. S. Lyford.

Coöperation with the U. S. Bureau of Education.

The Society for a number of years has been coöperating with the United States Bureau of Education mainly through the Secretary of the Society. At the Illinois meeting, Dean O. M. Leland of the University of Minnesota was appointed a committee to promote the study which had been started jointly by this Society and the Bureau of Education. For the past two years, the Bureau of Education has secured an accurate statement of the attendance at engineering schools, an analysis of which will be presented by Dr. W. C. John before this convention. Dr. John, representing the Bureau of Education, and Dean Leland, representing the Society, have under way a detailed statistical study of the curriculum of engineering schools. The type of questionnaire to accomplish this has been under consideration the past year and a typical example worked out. These are to be presented for consideration and criticism by the members of the Society at this convention.

REPORT OF THE SECRETARY.

COMMITTEE ON INTELLIGENCE TESTS.

This Committee was appointed at the Baltimore meeting in 1919, with the following personnel: L. L. Thurstone, Chairman, Wm. T. Magruder and C. R. Dooley. The Committee undertook to prepare proper questions for testing freshmen. These were distributed to various engineering schools, more than 100 having taken part in this work. It is the most comprehensive study of this type that has been undertaken since it covers a wide variety of schools in all parts of the United States. A preliminary report of these studies was printed in the January number of ENGINEERING EDUCATION. It is undoubtedly the most important contribution of this work that has appeared during the past few years. Although the Secretary's office ordered a large number of reprints, they were exhausted in a very short time, indicating the interest which different institutions have in this important problem. Many comments have come to the Secretary's office in regard to it.

COMMITTEE TO COÖPERATE WITH RAILROADS.

The Society has made several attempts to interest the representatives of the railroads in engineering education, but we have been unable to organize a joint committee. However, during the past year, a committee on coöperating relations between the railroads and the universities, consisting of 25 prominent railroad officials and 5 representing the colleges, was formed. Dean M. S. Ketchum, a representative on this joint committee recommends that a Committee on Relations of Engineering Colleges with Railroads be appointed. President Scott has appointed such a committee with the following personnel: E. C. Schmidt, Chairman; G. F. Swain, W. G. Raymond, H. E. Riggs, C. H. Mitchell, F. E. Turneaure, Anson Marston, and M. S. Ketchum.

MEMBERSHIP.

The Membership Committee has continued its effective work under the direction of A. A. Potter. He will report in detail

concerning the work of this Committee. It is, however, interesting to note in passing that the Society now has the largest membership in its history, 1732, and that the total number of new members added during the current year, namely 209, is the largest ever added during a single year.

Activities of the Society.

Starting with a membership of 87 teachers of engineering, with its activities confined to an annual meeting at which members presented papers on the various phases of engineering, the Society has grown to a membership of 1732 with activities, not only in all phases of engineering education, but it takes its place in the activities of the country wherever engineering education is an important factor. A mere list of its activities indicates its position and standing in the educational field.

The great number of activities within the Society itself are indicated by the fact that it has 26 standing committees, all actively engaged in some feature of engineering education. During recent years, its influence has been extended through coöperation with various other agencies interested in the same general field. At the present time, the Society is coöperating through representatives on various committees with such organizations as the National Industrial Conference Board, The Highway Education Board, the National Electric Light Association, the United States Bureau of Education, the American Council on Education, the professional engineering societies, the National Safety Council, the Committee on the Standardization of Colleges, the American Engineering Standards Committee, the Joseph A. Holmes Safety Committee, The James A. Coffin Fellowships Committee, the Engineering and Economics Foundation, the American Mathematical Association, the American Chemical Society, the American Physical Society, the American Association for the Advancement of Science, the Pan-American Union, the Association of Chinese and American Engineers, and the Chinese Institute of Engineers.

REPORT OF THE SECRETARY.

Meetings of the Society.

The Society has held joint meetings during the current year with other national societies. Notable among these were the meeting with the American Association for the Advancement of Science in Boston at which papers were presented by Ira N. Hollis, "The Place of the Engineer in Civilization"; Chas. F. Scott, "New Phases of Engineering Education"; with the American Society of Civil Engineers at which papers were presented by W. G. Raymond, "The Outlook of the Engineering Colleges of the Middle West," M. W. Alexander, "The Objective in Engineering Education," Chas. F. Scott, "The New Project of the Society for the Promotion of Engineering Education," and J. L. Harrington, "Coöperation of National Engineering Societies in Engineering Education." Notable meetings of the Sections of the Society were those held by the Kansas-Nebraska, New England, Minnesota and Ohio Sections.

Sections and Branches.

The Society at the Illinois meeting adopted additional By-Laws covering the subject of branches and divisions. Sections of the Society were authorized at the Baltimore meeting. Several sections were organized during the following years. Branches were started for the first time during the academic year of 1921–22. Twenty-seven were established at various institutions. In order to coördinate and facilitate this work, a Committee on Sections and Branches was created under the direction of F. C. Bolton. This Committee will report to the Society in detail in regard to the work of the Sections and Branches.

Divisions of the Society.

As an outgrowth of the meeting of the Deans of the Middle West institutions, the Society created, at the Illinois meeting, divisions of the Society which may be formed by any group of members for consideration of questions which relate particularly to that group. The Division of Deans and Administra-

tive Officers was organized at the Illinois meeting under this By-Law with W. G. Raymond as chairman. Provision is made on the program for two meetings of this Division. The report to the Society of the work of this Division will be made by the Chairman.

Publications.

The Society in its early years published a volume of *Proceedings* which was devoted exclusively to the papers and discussions at the annual meetings. In 1910, it began the publication of a monthly bulletin. Since that time, the Society has continued the regular publication of the volume of *Proceedings* and the Bulletin under the title of Engineering Education. In addition to this, it has published at different intervals various reports of committees, etc. There is submitted herewith a graph showing the constantly increasing cost of printing, it having practically doubled in the last eight years. Printing now absorbs more than half of the total income of the Society. The Secretary wishes to raise the question as to whether we shall continue all of these publications. If so, under what conditions?

One solution is that followed by some of the national engineering societies; namely, to print all of the proceedings of our meetings, and the papers submitted for publication in Engineering Education and distribute this free to members. Those members who desire to pay a small additional fee would receive a bound volume containing the proceedings of the annual meeting, reprinted from Engineering Education.

One of the most annoying features of the publications of the Society is the failure to have them appear on time. The following table shows the date when the material was sent to the printer and the date of mailing to members:

Sept.	number	sent	August 12.	Mailed	September 23
Oct.	"	"	Sept. 12.	"	October 27
Nov.	"	"	October 20.	"	December 6
Dec.	"	"	Nov. 17.	"	December 23
Jan.	"	"	Dec. 15.	"	January 23
Feb.	"	"	Jan. 23.	"	March 24

March	number	sent	Jan. 30.	Mailed	May 14
April	"	"	March 5.	"	May 21
May	"	"	April 25.	"	June 4
June	"	"	May 17.		

EXPANSION OF THE SOCIETY.

Each year sees additions made to the work of the Society. Each of its existing activities is broadened and new activities are added. Each expansion means additional expense. Some proposal must be forthcoming to meet these additional burdens, either by increasing the dues, expansion in membership, or securing funds from some sources other than the membership of the Society. These questions are laid before the Council and the members of the Society for their information and earnest consideration.

F. L. BISHOP,
Secretary.

COÖPERATION BETWEEN THE ENGINEERING COLLEGES AND THE BOARD OF INVESTIGATION AND COÖRDINATION.

BY J. RALEIGH NELSON,

University of Michigan.

The creation of the Board of Investigation and Coördination by the Society for the Promotion of Engineering Education has thrown down a challenge to the engineering schools of this country so imperative as to demand a prompt and enthusiastic response. The vision which inspired the Society to organize this board in the first place, and which has, with increasing clearness, animated the new Board in its deliberations must impress deeply all engineering educators with the large opportunity for service to engineering education. Here at last is the promise of that leadership so long needed. For years our faculties have studied the problems of engineering education with notable earnestness and intelligence. Such studies have usually, however, been quite sporadic, and have been deprived of their fullest effect because each faculty was working quite independently. Even the Society has not been quite coherent enough to unify such efforts, and turn them all to useful ends. In consequence there has been much waste motion. But here at last is the happy prospect of a central guiding body, which may inspire faculties too absorbed in the discussion of administrative details, to larger and more fundamental considerations, which may lay out a comprehensive scheme of investigation likely to accomplish definite progress, and may secure concerted interest and action in its execution. It is an inspiring moment in the history of engineering education.

It is not surprising, therefore, that the response of the engineering schools has been so immediate and so eager. Everywhere there is evidence not only of willingness to co-

öperate with the Board, but an almost impatient insistence on getting at the thing at once. If the new Board can only elaborate its plans quickly enough and take advantage of this eager psychology, it will find behind it a head of power sufficient to produce almost any desired work.

The temptation is strong to indulge in prophetic pictures of what may be accomplished by proper coöperation between the Board and the engineering schools. But as my dean is a member of the Board and I the chairman of his faculty committee charged with maintaining a close working relation between our college and the Board, I am restrained from suggesting anything too fanciful or too ambitious, since I know that he would immediately insist upon its being carried into action. It will be more discrete, therefore, for me to outline very simply what the Coöperating Committee at the University of Michigan, officially called the Committee on the Study of Engineering Education, has done thus far to prove the sincerity of its purpose.

The committee was appointed November 10 by the faculty of the College of Engineering in accordance with the suggestion contained in the report of the Development Committee of the Society. Its primary purpose was to coöperate with the newly constituted Board of Investigation and Coördination in its proposed comprehensive study of Engineering Education. Since this Board, at the time of our appointment, had not yet formulated its plan of procedure, our committee had necessarily to move somewhat slowly in the early stages of the work. Immediately upon our appointment, we met and assigned the lines of investigation as follows: Professor Hoad, the students; Professor Hopkins, the alumni; Professor Airey, the building equipment, and Professor Cannon the laboratory equipment, these two covering, therefore, teaching facilities; Professor Nelson, the teaching staff. It was agreed that the study of the curriculum should not be undertaken until another year. Having in a general way made a survey of our material for study and our facilities for the investigation called for, the Committee notified the Board that it was ready

to begin its work as soon as it received specific and detailed instructions.

As the Board had not yet had time to work out its plans in detail, and, as our committee was the first faculty committee to report for duty, President Scott suggested that we work out a general plan and prepare the necessary questionnaires, which we might submit to the Board for approval. If these proved satisfactory, they might be of value to the Board in its directions to other similar faculty committees. We thoroughly appreciated the challenge for service afforded by this suggestion and went to work with great enthusiasm.

When, after a number of conferences, our questionnaires were ready, they were submitted to the Board in session in New York and, after some very constructive criticism, were approved. The committee therefore, at once set to work.

The completed report on the five lines of investigation at present being pursued by the committee, will, it is hoped be in the hands of the Board by January first of next year. In spite of that apparently remote date, the work has progressed rapidly and with the promise of interesting results. The actual accumulation of data has been already nearly accomplished, but the opportunity for the study and interpretation of these data is too large to make it seem advisable to hurry this part of our work. In fact the magnitude of the enterprise has grown upon us so largely as we have got into it, that we are quite unwilling to deal with it in any superficial manner.

The results will have significance, anyway, only when collated and studied by the Board in connection with similar results from dozens of other colleges. The details of the finished report will hardly be of interest at present. A brief statement, however, of our method of investigation may prove suggestive for similar studies of those who may decide to cooperate with the Board in some such way.

In the investigation of teaching facilities both buildings and laboratory equipment are being studied. The building equipment is being stated in terms of area, volume and in-

vestment, with a record also of any unusual building features. The data to be obtained by this questionnaire and the one on laboratory equipment are so largely available in the records of various offices of the University, that no special comment is perhaps necessary except upon one problem which will require some consideration by the Board if results similar to ours are to be compiled for comparative study. It should be noted that there is very little uniformity in various institutions in the method of taking inventories of physical equipment. Especially will it be found that methods of figuring depreciation, and methods of upkeep differ widely in different schools. Figures from inventories often give you little really accurate idea of present values at all, which is, of course, what in the present study is wanted. The Board will have to determine upon some simple method of making inventory satisfactory for their purpose, and then will have to induce all coöperating schools to agree to use that method. Possibly, if the Board could afford to do so, it would be still better to employ an expert appraiser to conduct a study of the laboratory equipment of the schools under consideration. The latter method would at least produce uniform results, though the relative unimportance of this part of the investigation might make it too expensive to be profitable.

The student questionnaire was submitted to the members of the present senior class at one of its regular assemblies so that answers are at hand from practically all of our this year's graduates. The main objectives of this questionnaire are to determine the source from which our students come,—their home, school and industrial background,—their characteristics, and their activities on the Campus. Assuming that the present senior class is typical, the Committee has confined its study to the members of that class. Since this particular class was the one to which were submitted the intelligence tests approved by the S. P. E. E. committee under Dean Thurston, there is available for study not only their high school and college scholarship records, and the answers to the present questionnaire, but also the record of the intelligence tests

given them in their freshman year. With all this evidence, it should be possible to get a fairly accurate profile section of a typical class in our college.

The method of study is, first, to analyze the results of the present inquiry with reference to one point after another, as for example, the proportion of college expenses earned by each student, and then to study successively the scholarship records from high school up to the present and finally to utilize the data from the intelligence tests. A great many lines of investigation are already suggested by this interesting array of evidence.

The study of the faculty similarly aims to determine the source from which our teachers come, their background and experience. In addition, productivity,—the lines of research followed, the amount of publication done, the outside engineering practice engaged in, this and the general usefulness of the man to the university due to his activities outside the class room and to the community in which he lives by virtue of his part in public affairs, are all to be studied in an effort to get a simplified, graphic picture of the individual teacher. Because of the fullness of our data here, it should be possible for us to reach some useful generalizations regarding the various classes of the faculty.

The method used here to obtain our data is as follows: Every member of the faculty is required by the Dean to fill out the questionnaire as completely as possible. These answers are then typed in uniform style and bound in alphabetical order. They are then placed in the Dean's office as a permanent record of our faculty which is at all times available for anyone who cares to refer to it.

Additional material for the study of the faculty is furnished the Committee by the rating system which had already been worked out previous to our investigation. This is somewhat similar to the system used in the army. Each member of the faculty is rated independently by from fifteen to thirty other members of the faculty to whom he is actually known. The results of this rating system have already been of practical

value to the administration in some cases in determining promotions, etc., but no generalizations have been made from the great mass of interesting evidence. The Committee proposes to correlate these data with that obtained from the faculty records, and to use it as supplementary evidence. It should give a means of estimating our faculty members not only on the basis of their own records of their life history but on the impression they have made on their fellow-workers. The appraising of personality and the estimating of individual effectiveness is so delicate a task that every pains should be used to devise ways of checking the errors of one method by those of another.

It is hoped that the Committee may get from the alumni of the college not only a statement of the facts regarding their professional careers, but also an expression of opinion regarding the adequacy of their college training and the frank, constructive criticism of education in general which practical men with the perspective furnished them by years of professional and industrial life are specially fitted to give. It will be noted that the questionnaire, for this reason, consists of two parts, the more significant of which affords the alumnus an opportunity to talk quite freely and frankly. 4,500 copies of this questionnaire with a letter of personal greeting from Dean Cooley were mailed to our alumni. The response was immediate and enthusiastic. The answers indicate that a large number of our graduates have definite opinions regarding engineering education. Fully half of them take pains not merely to give us the data called for by the first part of the questionnaire but go definitely into the discussion of the topics suggested by the second part.

The replies to the four major questions are being typed on 4″ x 6″ cards. These cards are arranged according to the four questions. Within each of these groups, the cards are arranged by class years, so that one can quickly determine the opinion of the men of various ages regarding any of the questions. The replies are, of course, necessarily often abbreviated, but, as each card bears the name of the man, reference

can always be made to the original letter in our files. It will take several weeks yet to tabulate these data, but, when it is done, we are sure we shall have a valuable collection of opinions.

The Committee on the Study of Engineering Education at the University of Michigan is enthusiastic over its task. The very fact that it seems to loom up larger and larger as we get further into it, is in itself very inspiring. What we are doing is bound to be useful to our college, anyway, but if it shall become a part of a larger investigation in which the Board of Investigation and Coördination shall secure the cooperation of all the engineering schools in the country, then we may hope for results that may be significant and influential in the development of engineering education. Personally and on behalf of my committee, I want to say to the Board that we are at its service and ready to coöperate vigorously and enthusiastically.

UNIVERSITY OF MICHIGAN, COLLEGES OF ENGINEERING AND ARCHITECTURE.

Questionnaire for Study of Teaching Facilities.

Buildings.

1. What is the enrollment of students of Engineering and Architecture for the year 1922–1923?

   In answering the following questions, note: When some of the work is given by departments outside the college of engineering, the proportionate amount of teaching facilities, floor space and teaching staff should be approximated.

2. What is the net floor space used, expressed in square feet?
   (*a*) Laboratories? Also how many?
   (*b*) Drawing Rooms? Also how many?
   (*c*) Class Rooms? Also how many?
   (*d*) Offices, including administrative offices? Also how many?

   Note: "Net" means actual space exclusive of walls and corridors.

3. What is the net volume of space expressed in cubic feet:
   (*a*) Laboratories?
   (*b*) Drawing Rooms?
   (*c*) Class Rooms?
   (*d*) Offices, including administrative offices?

   Note: Floor thickness is not to be included.
4. What was the date of the construction of each building and the cost of the same, including any subsequent modifications and extensions?

   Note: If part of a building is used, the proportionate value should be taken in relation to floor space used.
5. State, for each building, the number of stories and the material of construction.
6. What facilities for field work are owned or controlled by the college?
7. How many student recitation hours were taught in the year 1922–1923, first semester? Second semester?

   Note: A recitation hour is to be taken as one hour in class each week for one semester, or the equivalent.
8. How many student laboratory hours were taught in the year 1922–1923, first semester? Second semester?

   Note: A laboratory hour is to be taken as three hours in the laboratory per week for one semester, or the equivalent.
9. Give the teaching staff classified as follows:

   Professors,
   Associate Professors,
   Assistant Professors,
   Instructors,

   or such classification as you use.

   Give the number of teachers in each group and the maximum, minimum and average salary for each class.
10. A classification similar to that called for in paragraph 8 should be made for part time men.
11. How many square feet of office space have you per faculty member in each of the departments, as—Mechanical Engineering Department, Physics Department, Mathematics Department, English Department, etc.?

QUESTIONNAIRE FOR STUDY OF TEACHING FACILITIES.

Laboratories.

1. Classify the laboratories for each department of instruction.

In answering the following questions, note: When some of the work is given by departments outside the College of Engineering, the proportionate amount should be approximated.

2. What is the inventory figure for apparatus and equipment for each separate laboratory?
3. What is the inventory figure for apparatus and equipment in frequent or constant use for undergraduate instruction in each laboratory?
4. What is the inventory figure for each separate laboratory for any special apparatus and equipment of unusual character used only occasionally, *i.e.*, two or three times per year, or reserved for use by members of the faculty and advanced students? Give brief description of each unit of equipment representing an investment of over $5,000.
5. What was the total number of students taking instruction in each laboratory in the year 1922–1923, first semester? Second semester?
6. What is the average number of students handled by one instructor during one period of instruction?
7. How many hours per week is each laboratory in use?
8. What grade of teaching staff is used in giving laboratory instruction?

Questionnaire for Study of Teaching Staff.

The questionnaire which is to be submitted to the members of the faculty has been made to correspond as closely as possible with that used with the students and alumni in order that the tabulation of the data from the various studies may be simplified.

Each member of the engineering faculty is asked to prepare for the Dean's office a complete statement of the information called for by the following list of questions:

1. Date and place of birth.
2. Father's business.
3. Ancestry of parents. Nationality.
4. Education; early, high school, college, university.
5. Degrees, fellowships, honors; with dates.
6. Professional record; positions held chronologically arranged; engineering practice.
7. Publications; investigations or plans, completed or in progress.
8. Membership in societies, national, state, or local.

9. Membership in clubs.
10. Activities inside and outside the university during the current year.

Senior Class, 1922–1923.

1. Name.
2. Date and place of birth.
3. Father's business.
4. Ancestry of parents. Give nationality of each, as United States, England, Italy, China, etc.

   Father.
   Mother.
   Father's father.
   Father's mother.
   Mother's father.
   Mother's mother.

5. Education. Give name of school. If not a graduate, indicate time spent in each school.
   Early school.
   High school or academy.
   College or university.
6. Degrees, scholastic honors, etc., achieved before coming to the University.
7. Positions held in Campus organizations, arranged chronologically.
8. Other Campus activities not covered by 7.
9. Membership in societies, fraternities, and other organizations, national, state and local.
10. Approximately what percentage of your colloge expenses have you earned during the nine months of the college year?

    Freshman.
    Sophomore.
    Junior.
    Senior.

QUESTIONNAIRE FOR STUDY OF ALUMNI.

Each alumnus of these colleges is asked to prepare a complete statement of the information called for by the following list of topics:

Date and place of birth.
Father's business.
Ancestry of parents (nationality).

Education—country school, village school, city school, high school, college, university.
Degrees, fellowships, honors—with dates.
Professional record; positions held, chronologically arranged, engineering or architectural practice.
Publications: investigations or plans completed or in progress.
Membership in societies (national and local).
Membership in clubs.
Record of activities in relation to public life outside the profession of Engineering or Architecture.

The following information is desired (1) on the relation of your course in college to the position you now occupy. (2) on the value of your engineering knowledge and training in your present duties, (3) on the characteristics of your present occupation.

(1) Check below on the left your department of specialization in college, and mark 1, 2, 3, 4, on the right in order of importance the principal fields of your present work:

Civil Engineering		Marine Engineering	
Mechanical Engineering		Aeronautical Engineering	
Electrical Engineering		Architecture	
Chemical Engineering		Architectural Engineering	

(2) Of what relative value to you at present are your College training and your subsequent experience? Indicate by an "X."

	Essential	Important	Small	Nil
College Training				
Subsequent Experience				

(3) What are the characteristics of your present duties? Indicate order of importance with numerals 1, 2, 3, etc.:

Research		Administration-Management	
Design		Commercial-Sales etc.	
Construction		Consultation	
Operation		Teaching	
Maintenance			

Give approximate number of employees supervised.

The Committee on the Study of Engineering Education would welcome your suggestions with respect to the general subject of Engineering Education. The following questions are merely suggestive of the kind of information and opinions the Committee desires. Judged from your experience.

I. *What are the Facts of our Changing Civilization that Must be Considered by our Engineering Schools?*

What constitutes the function of an engineer today and what will be his function in the future?

In what ways can the engineer of tomorrow take a more important part in great enterprises (*a*) in general services of organizations and leaderships, (*b*) in technical service in the solution of new problems?

II. *In What Ways can Engineering Education be Best Developed Broadened and Enriched?*

Should the Engineering School follow the example of other professional institutions by lengthening courses?

Should there be different types of engineering preparation to produce (*a*) broadly educated men, and (*b*) highly trained specialists?

What can be done by Engineering Schools to make the graduate engineer more fully appreciate and more adequately fulfill his general obligation to society?

III. *What in Your College Course Contributed Most to Your Professional Success or to Your Success in Other Lines after Leaving College?*

What in your Engineering course contributed least? Was this due to content or manner of presentation?

IV. *How can Engineering Schools Attract into the Teaching Field the Kind of Men Best Fitted for Teaching?*

General Remarks:

BOOK REVIEW.

Electricity and its application to Automotive Vehicles. PAUL MCDOWELL STONE (Michigan State Automobile School). Cloth bound, 6" x 9"—844 pages—371 illustrations. $4.00.

"A piece of work well done." This book is one of the best, if not the best of its kind, supplying a need of the automotive service. Any automobile mechanic, owner or student can use this book very profitably, as the principles of electricity and magnetism are so clearly and simply explained, that any one with little or no knowledge of the principles of electricity can get these principles by studying this book. The first part of the book is devoted to the explanation of all of the fundamental principles upon which the electrical systems of the automobile depend for their operation. All necessary information applying to the, care—operation—and testing of primary and storage cells, when in use or out of the car is very well handled. Electrical measuring instruments, testing instruments, battery ignition systems and all makes the types of magnetos, spark plugs, relays, regulators, electric motors, electric generators, etc. are explained in detail.

The chapters on trouble shooting, and car illumination are very complete. In fact this book could well be named, "The Encyclopedia of Automotive Electrical Systems." It meets the needs of all automotive schools and service stations, both electrical and general, and in fact could be adopted by the institution of higher learning to cover the electrical end of their automobile engineering courses.

E. J.

BOOKS RECEIVED.

English for Engineers. S. A. HARBARGER, 1st Edition. McGraw-Mill Book Co., Inc. 1923.

Engineering Kinematics. W. G. SMITH. McGraw-Hill Book Book Co., Inc. Second Edition, 1923.

Foundations, Abutments and Footings. Compiled by a Staff of Specialists. Editors-in-Chief: GEORGE A. HORL, and W. S. KINNE. McGraw-Hill.

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